FOREST PRODUCTS LABORATORY † FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

VENEER CUTTING AND DRYING PROPERTIES

SOUTHERN PINE

The southern pines are one of the principal softwood groups growing in the United States. The term southern pine is applied to several species of the genus Pinus, the most important of which are: longleaf pine, P. palustris; slash pine, P. elliottii; shortleaf pine, P. echinata, and loblolly pine, P. taeda. They grow principally in the Southeastern States that border on the Atlantic Ocean and the Gulf of Mexico.[1]

The wood of the southern pines varies from dense, hard, and resinous to comparatively light in weight, soft, and low in resin content. Most of the available timber is second growth and has wide bands of sapwood. The sapwood is light yellow in color and the heartwood is reddish brown. The southern pines have a marked contrast in density between springwood and summerwood; the summerwood is 2 to 3 times as dense as the springwood.[2] The wood is used extensively as construction lumber, pulpwood, railroad ties, poles, and piling. It is also used to a limited extent in veneer containers and for the manufacture of plywood.

Description of Logs Studied

Veneer cutting and drying studies at the Forest Products Laboratory were made on nine 16-foot logs. Information available indicates that all the logs were loblolly pine. Most of the test material had 6 to 12 annual rings per inch of radius. Six of the logs came from Crossett, Ark.,[3] and 3 came from Polk County, Tex.

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[1]Betts, H. S. The Southern Pines. American Wood Series. Forest Service, U. S. Department of Agriculture. Rev. July 1954.

[2]Paul, B. H. Variation in the Specific Gravity of the Springwood and Summerwood of Four Species of Southern Pine. Journal of Forestry, Vol. 37, No. 6, June 1939.

[3]The logs from Arkansas were cut as part of a cooperative agreement with the Crossett Lumber Company.

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† Maintained at Madison 5, Wisconsin in cooperation with the University of Wisconsin

The six logs from Arkansas were reported to be typical of logs on Crossett Lumber Company lands that would be available for use in a plywood plant. These logs were 14 to 20 inches in diameter. Three of them had an eccentricity greater than 1 inch, and 5 of the 6 had appreciable areas of compression wood.[4] The six logs were used for rotary cutting tests.

The 3 logs from Texas were 25 to 26 inches in diameter, and were designated by the Southern Pine Inspection Bureau to be of prime grade. One log had an eccentricity of 2 inches while the other two logs were nearly round. Compression wood was not noticed in these three logs. Rotary cutting and slicing tests were made on this material.

For veneer, logs with uniformly slow growth are preferred over fast-grown stock. On the basis of the test material studied, it appears that the main defect to be avoided in veneer logs is compression wood. This abnormal wood is frequently found in eccentric southern pine logs.

Preparation of Logs for Cutting

The best cutting was done with wood that had been heated at 180° to 200° F. Bolts heated at 200° F. sometimes developed excessive end splits. End splitting was not so pronounced in bolts conditioned at 180° F.

End splitting was not a problem when flitches were heated. Consequently, flitches could be conditioned in water at 180° F. or in steam, whichever is more convenient for the plant operator.

Southern pine veneer logs or flitches conditioned in water at 180° F. should be heated for the following periods:

Average log diameter (Inches)	Required heating time (Hours)
12	8
18	24
24	46

[4]Compression Wood: Importance and Detection in Aircraft Veneer and Plywood. Forest Products Laboratory Report No. 1586. September 1943.

Average end dimension of flitch	Required heating time
(Inches)	(Hours)
6	6
8	10
10	16
12	22

If the flitches are heated in a steam chamber at atmospheric pressure (temperature 180° F. or higher), the required heating time can be reduced 5 to 10 percent.

Lathe and Slicer Settings

Settings[5] that were satisfactory for cutting veneer of various thicknesses are given in tables 1 and 2.

Table 1. --Lathe settings

Veneer thickness	Lathe knife		Pressure bar		
	Bevel[1]	Angle	Bevel	Vertical opening	Horizontal opening
In.	Deg.	Deg. -Min.	Deg.	In.	In.
1/8 (0. 125)	21	89-50	15	0. 028	0. 110
1/16 (0. 0625)	21	90-15	15	. 016	. 055
1/32 (0. 0312)	21	90-40	15	. 008	. 025

[1]Rockwell hardness, 58. Hollow ground, 0. 002 inch.

[5]Fleischer, H. O. Experiments in Rotary Veneer Cutting. Proceedings, Forest Products Research Society. 1949.

Table 2. --Slicer settings

Veneer thickness	Slicer knife		Pressure bar		
	Bevel[1]	Angle	Bevel	Vertical opening	Horizontal opening
In.	Deg.	Deg. -Min.	Deg.	In.	In.
1/4 (0. 250)	22	90-15	12	0. 035	0. 240
1/8 (0. 125)	22	90-15	12	. 035	. 115

[1]Rockwell hardness, 62. Flat ground.

Veneer Drying

The moisture content of the sapwood veneer varied from 80 to 140 percent, and the moisture content of the heartwood veneer varied from 31 to 38 percent. Most of the rotary-cut veneer and all of the sliced veneer contained sapwood. Consequently, most of the veneer was dried according to the following schedule:

Veneer thickness	Temperature in dryer	Time in dryer	Final moisture content
(Inch)	(°F.)	(Minutes)	(Percent)
1/4	320	34	2-4
1/8	320	16	2-4
1/16	250	10	2-4
1/32	250	5	2-4

The wetter portions of the sapwood required about 10 percent longer drying time than that listed, while the heartwood dried in 25 percent less time.

All of the sliced veneer dried satisfactorily. Most of the rotary-cut veneer developed splits and buckled during drying.

The quarter-sliced veneer shrank 4 percent in width and the rotary-cut veneer shrank 7 percent in width during drying to 2 to 4 percent moisture content.

Veneer Yields

Based on the Doyle log scale, the actual yield of rotary-cut veneer showed an overrun of about 20 percent, while the sliced veneer showed an underrun of about 30 percent. Approximately 70 percent of the veneer produced was clear. However, most of the rotary-cut veneer developed splits when it was dried or when it was glued into panels in a hot press. In contrast to the rotary-cut veneer, the sliced veneer had no degrade due to drying or pressing into panels. In other words, a lower yield but a higher grade of veneer can be produced by slicing southern pine logs rather than by rotary cutting them.

Plywood

Plywood panels made with rotary-cut veneer developed an excessive number of checks and splits in the face veneers. Panels made with quarter-sliced veneer faces were free of checks and splits. Most of the panels made from rotary-cut veneer containing compression wood warped. Warping was not a problem in panels made from veneer that was free of compression wood.

There was no trouble in gluing the southern pine veneer into plywood with a phenolic glue in the hot press. Other tests have shown that southern pine is in the group of woods that glue well with different glues under a moderately wide range of gluing conditions.[6]

Plywood made from rotary-cut southern pine veneer should be satisfactory for uses such as sheathing and containers. Southern pine plywood made with quarter-sliced veneer faces has an attractive appearance when it is given a clear finish. The hardness and wearing characteristics of plywood faced with quarter-sliced southern pine veneer should make it useful as flooring.

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[6] U. S. Department of Agriculture Handbook No. 72, Wood Handbook. p. 234. 1955.